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USE OF EFFECTIVE HERBICIDE TREATMENTS FOR ARTIFICIAL REGENERATION OF LONGLEAF PINE

By

Larry R. Nelson, Steven A. Knowe, and Dean H. Gjerstad

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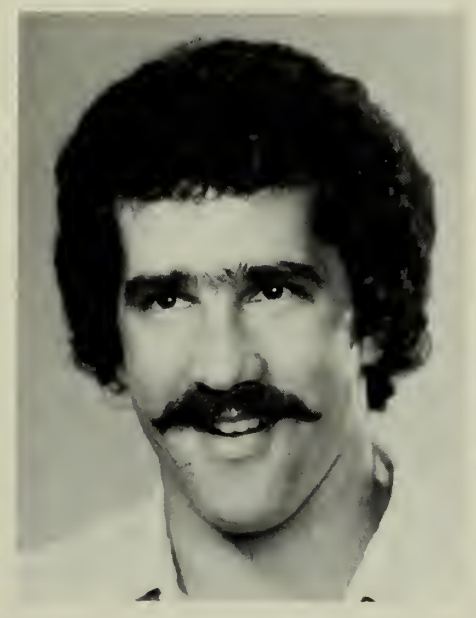

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USE OF EFFECTIVE HERBICIDE TREATMENTS FOR ARTIFICIAL REGENERATION OF LONGLEAF PINE

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ABSTRACT

Longleaf pine height initiation and growth were compared on plots receiving one of four weed control treatments with nonweeded control plots. Weed control treatments, initiated in the spring following planting, included total weed control (broadcast) for 1 and 2 years, and weed control in five foot bands for 1 and 2 years. After two growing seasons, 76 percent of seedlings were out of the grass stage in weeded plots which was more than twice that of nonweeded controls. Consequently, mean heights in weeded plots were twice those in the controls.

INTRODUCTION

A major problem involved with the establishment of longleaf pine (*Pinus palustris* Mill.) is that natural or planted seedlings may remain in the grass stage with no height growth initiation for a period of 2 to 18 years after planting (6). This has put longleaf pine in disfavor with many foresters who then establish other species, such as loblolly pine (*Pinus taeda* L.) or slash pine (*Pinus elliottii* Engl.) on sites which are better suited to longleaf pine. Competition from herbaceous weeds has been recognized as a primary cause of the delayed growth (5) (Figure 1).

Pessin (1939), showed that herbaceous weed control conducted at age twelve in a natural longleaf stand (still in the grass stage) promoted height growth initiation. By age seventeen, trees receiving weed control averaged three times the height of those without control. He demonstrated a similar sensitivity of longleaf pine to grass competition again in 1944 using a potted seedling technique. Others (1,2), have found that for natural regeneration, scalping the seedbed prior to seedfall also promotes early height initiation. Bruce (1) showed that scalping and methods of burning that kill grass roots were more effective in promoting height growth than treatment with the relatively ineffective herbicides available at that time. Herbicide technology has improved though. A few products are currently registered for controlling herbaceous weeds in loblolly pine plantations. Other effective products are being developed for registration through the Auburn University Silvicultural Herbicide Cooperative. Some benefits of effective herbicide treatments in loblolly pine stands have been demonstrated (3). The following study was conducted to determine whether total weed control with herbicides would promote height initiation of artificially regenerated longleaf pine seedlings.

MATERIALS AND METHODS

The study area is located in southwest Georgia on a deep, well-drained loamy sand soil. Before the study was installed, the site was occupied by a stagnated 20-year-old slash pine plantation with prickly pear (*Opuntia compressa* (Salisbury) Macbride) and other dry-site species in the understory. The site was prepared by chopping and disking, and seedlings were planted at a 4 x 12 ft spacing during the 1980 dormant season. Following site preparation, Florida pusley (*Richardia scabra* L.) was the dominant weed species.

Treatments were initiated in spring of 1981 and included total weed control (broadcast for 1 and 2 years), weed control in bands (5 ft. bands centered over the row) for 1 and 2 years, and no weed control. Each treatment was replicated four times in a randomized complete block design. Plots were 80 x 80 ft. First-year weed control was accomplished by applying a tank mix of Roundup (glyphosate) and Goal^{R} (oxyfluorfen) over covered seedlings with a bicycle sprayer. Weed control in the second year was obtained by applying Goal^{R} with a farm tractor.

Weed competition was assessed by determining production per acre based on dry weights of weeds clipped from five 2.5 ft. x 2.5 ft. subplots within each of the nonweeded controls. Pines were measured in the fall of 1980 and again in December of 1981. Seedling heights and percent seedling emergence from the grass stage were recorded.

RESULTS AND DISCUSSION

The average weed biomass on the control plots was 1855 lbs/acre (dry weight) at the end of the first growing season. Average heights and percent of seedlings out of the grass stage are summarized in Table 1. Trees in both 1-year weed control treatments are almost twice as tall as trees with no weed control, while trees on the 2-year treatments are more than twice as tall as trees receiving no weed control. Differences at this age can be largely attributed to differences in the percentage of trees in the grass stage (Figure 2). By the end of the second growing season, more than twice as many trees were out of the grass stage on the treated plots as on the plots that had no weed control.

Although the stand is still young, this study demonstrates that early control of herbaceous competition with the use of herbicides can reduce the length of time longleaf pine seedlings remain in the grass stage. As mentioned above, longleaf pine growth response to weed control has been recognized for nearly fifty years. The practical application of this knowledge may soon be possible because of advances in chemical weed control research. The next step is to register cost effective products for this purpose. If used properly, effective weed control methods would increase the chances of successfully regenerating longleaf pine and renew interest in its production on appropriate sites.

Table 1. Mean height and percent of seedlings out of grass stage at the end of two growing seasons for a longleaf pine growth impact study installed on Great Southern Paper Company land.*

Treatment	Mean Height (ft)	Percent of Seedlings Out of Grass Stage
Total - 2 years	0.93 a	79.1 a
Band - 2 years	0.85 ab	81.0 a
Total - 1 year	0.72 b	74.0 a
Band - 1 year	0.71 b	71.6 a
Control	0.38 c	34.7 b

*Means followed by the same letter are not significantly different at the 5 percent level of Duncan's New Multiple Range Test.

Figure 1. The longleaf seedling on the left is surrounded by a clump of crabgrass and has not initiated height growth while the seedling on the right is free of weed competition and has begun height growth. Both seedlings were in the second growing season in the field.

Figure 2. Nearly all of the seedlings receiving two years of weed control (5 ft band centered over the row) have emerged from the grass stage during the second growing season in the field (A) whereas trees in nonweeded control plots remained in the grass stage for the same period (B).

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